CLADISTIC ANALYSIS AND CLASSIFICATION OF THE GECARCINIDAE (CRUSTACEA: BRACHYURA)

The land crabs of the family Gecarcinidae constitute a circumtropical group of eighteen species belonging to the genera *Cardisoma* Latreille, 1828, *Epigrapsus* Heller, 1862, *Gecarcoidea* H. Milne Edwards, 1837, and *Gecarcinus* Leach, 1814.

The main goals of this work were: (1) to provide a phylogenetic reconstruction for the genera of the Gecarcinidae and the species of *Gecarcinus*; (2) to use phylogenetic information to improve the classification of the group, and attempt to clarify the relationships between the families Gecarcinidae, Grapsidae and the genus *Ucides* Rathbun, 1897.

Sixty-eight morphological characters were selected and analysed. These are available from the author upon request. Six species belonging to different subfamilies of Grapsidae were selected as the out-group. The cladistic analysis was undertaken using the 'Hennig 86 vers. 1.5' program.

Relationships within Gecarcinidae

The species of Gecarcinidae probably evolved from an ancestor that had the dactyli of the pereiopods armed with rows of spines; branchial and hepatic regions strongly inflated, and carapace transversely oval.

The cladogram in Fig. 1 shows that the first cladogenetic event split the genus *Cardisoma* from the group *Epigrapsus* + *Gecarcoidea* + *Gecarcinus*. The majority of the characters analysed are plesiomorphic to *Cardisoma*, and do not show great morphological modification from the typical Grapsidae facies. Its sister group *Epigrapsus* + *Gecarcoidea* + *Gecarcinus* exhibit, on the other hand, several synapomorphies concerned with the buccal region.

One character however (pterygostomian region densely setose) suggests a conflicting hypothesis for the position of the genus *Epigrapsus* in the phylogeny, as this character is shared by *Cardisoma* and *Epigrapsus* and could be interpreted as synapomorphic for them. There are however seven other homoplasic characters (shared by the group *Epigrapsus* + *Gecarcoidea* + *Gecarcinus*). Thus, the more parsimonious hypothesis is that which admits the homoplasy of the densely setose pterygostomian region character.

The next cladogenetic event split *Epigrapsus* from the group *Gecarcoidea* + *Gecarcinus*, which have deep modifications in the frontal, orbital, suborbital, pterygostomian, antennal, antennular and abdominal regions.

The third cladogenesis split *Gecarcoidea* and *Gecarcinus*.

FIG. 1. Phylogenetic relationships within Gecarcinidae.

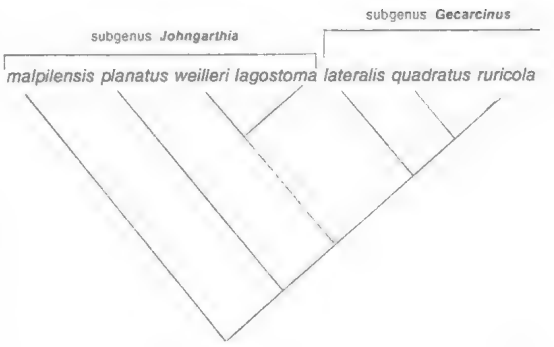

FIG. 2. Cladogram illustrating the artificial assemblage (*Johngarthia*) within the genus *Gecarcinus*.

These two genera remain rather conservative in relation to the changes in the morphology observed during the previous cladogenetic event. The strongest morphological changes occur in the orbital and buccal regions (Fig. 1).

Phylogeny of the Genus *Gecarcinus* and its Implications for the Classification of the Group

The species of *Gecarcinus* probably evolved from an ancestor which had the orbit closed by the intra-orbital spine and the palp of the third maxilliped concealed beneath the maxilliped.

Gecarcinus malpilensis proved to be the more external branch of a symmetric cladogram, and was followed in a sequence by *G. planatus* and the group formed by *G weileri* + *G. lagostoma*. The maxillipeds were the principal morphological structures affected during the evolution of these species/groups. The three last branches of the cladogram in Fig. 2 correspond to *G. lateralis*; *G. quadratus* and *G. ruricola*, which show, beside the modifications to the maxillipeds, strong modifications of the pleopods.

Türkay (1970) created the subgenus *Gecarcinus s.s.* (for *G. lateralis*, *G. quadratus* and *G. ruricola*) and *Johngarthia* (for *G. malpilensis*, *G. palanatus*, *G. lagostoma* and *G. weileri*). The subgenus *Johngarthia* from my results, however, appears to be a paraphyletic assemblage which embraces the four initial branches of an asymmetric cladogram with seven terminal taxa (Fig. 2).

Literature Cited

Türkay, M. 1970. Die Gecarcinidae Amerikas. Mit einem anhang über Ucides Rathbun (Crustacea: Decapoda). Senckenbergiana Biologica 51: 333-354.

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